

# Using Smart Phones as Digital Wallets

INFO-I 399

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## Introduction

This paper provides general overview about digital wallet and its functions. Furthermore, the paper analyses problems of digital wallet applications and provides suggestions on how to overcome those problems.

A “digital wallet” refers to a mobile application for smartphones that allows users to replace their wallet with smartphone technology, by giving options like making payments and performing monetary transactions solely using the technology inside of the device, as well as providing valid forms of identification and containing other items that may be found in a wallet (such as customer affinity cards or coupon offers). It can hold a user’s payment information to identify the user automatically, as well as shipping information to speed up transactions. The consumers benefit since it is convenient in multiple ways. Customers do not need to carry their traditional wallet anymore because their electronic devices can replace their cash or credit card. Additionally, the complex transactions are no longer needed because digital wallet allows consumers to purchase based on information inserted. Merchants can benefit from digital wallet applications since it is fast and can guarantee the transaction in a ‘safe’ way.

This is an interesting field because of the emerging smart phone technologies available today. Smart phone application developers are continuing to innovate by giving more functionality to smart phones on a regular basis. The digital wallet design space is particularly interesting because the features involved are ones that are a necessity to all people in a given society. Every society today uses some form of currency, so this is an area that could eventually include people from many different walks of life.

Can the digital wallet replace the traditional wallet that we know today? This paper will examine all of the available technologies in this design space as well as the research surrounding the topic to show how these types of applications are improving upon the concept of the traditional wallet. Our conclusions will assess how the digital wallet compares to the traditional wallet as developed right now, and then provide recommendations for how digital wallet applications can be boosted to an equivalent level of usage as the traditional wallet.

## Related Work

‘Square’ is one of the popular digital wallets used by merchants. It is used in various fields such as music industry, salon, auto shop, hospital, and law office. The way ‘Square’ works is simple since it just requires small device connected to phone. Merchants can register their information online and apply for the device & service. After they receive the device, they can just use that device to process payments. ‘Square’ allows merchants to accept cards anywhere so small business like music band enjoys the features. They can simply accept cards as entrance fee for their concert and it actually increases their profit. In general, merchants who used ‘Square’ experienced increased benefit and profit. The ease of payment is the crucial merit of using digital wallet like ‘Square’. Transactions have been simplified through ‘square’ but only disadvantage might be there is transaction fee per purchase. Due to the characteristic of digital wallet, it requires around 3 percent transaction fee and it is a lot more than those of credit cards. <sup>[15]</sup>

Google’s version of the digital wallet is simply called Google Wallet. Google Wallet claims two areas of function: in-store and online. The in-store features boast that any transaction in a participating business will be condensed down to merely tapping the smart phone on existing PayPass readers located at the register. This is possible because Google Wallet stores the user’s credit card information in addition

to related store offers, certain merchants' gift cards and customer affinity cards. Currently, Google Wallet can only store Citi MasterCard credit cards and Google prepaid cards, but displays this mission, "We aim to eventually support all the payment cards you keep in your leather wallet today. So the only plastic you'll need is your phone." The online tool is referred to as "Google Checkout," but is still considered to be under the umbrella of Google Wallet. Google Checkout asks the user to create an account to host their credit card information. Online businesses can employ the use of the Google Checkout plugin, which the user can select as they checkout. The benefit to users of selecting Google Checkout is avoiding entering credit card information multiple times. Merchants that accept Google payments do not incur any extra charges at the point of transaction. Google Wallet (including Google Checkout) accounts are free for users to hold. <sup>[7][8][9]</sup>

PayPal Mobile is a mobile payment application that allows you send money and make payments in stores. This Mobile application works on the iPhone, Android, and Blackberry phones. PayPal has an application, runs through a mobile browser, and can be in used through simple text messaging. The restriction with PayPal currently is that the application has no in-store part of the application. All the retail transactions that PayPal allows are online purchases. Since they have no in-store function of their application they are very limited to the market of people trying to replace their wallets with mobile applications. The PayPal application uses a few different forms of payments: paying for something online, sending money to someone, and receive money. But, they have no in-store function. PayPal's main function and claim to fame is making secure online payments. The application has an eBay function and gives you the ability to speed through retail checkouts online. PayPal does give you the ability to send money to someone, as a gift, pay someone you owe, or even pay a bill. The main use for this software is for use with eBay and making purchases online. When you use the PayPal application of your mobile device the main function is the use of making purchases on online shopping sites. Since there is no in-store function of the mobile application the use of this application is virtually the same as using PayPal on the eBay website.

Visa V.me the new digital wallet by Visa, which works a lot like PayPal, is meant to make it easier for customers to make online purchases, especially from their mobile phones. It can be used for personal, business, and development. For personal, V.me securely store user payment and shipping information, and access it at checkout using just email address and password. It stores all kind of credit card, not just Visa. Through user car's existing liability and protection polices, user never liable for unauthorized purchases. Email or text-message will inform user for purchase activity. For business, V.me lets customers check out quickly because they don't have to enter their card account information every time they shop online. For the security purpose, customers keep their address and billing info saved in their V.me accounts, verify the identities of returning customers to reduce fraudulent transactions and they use multiple layers of security, including fraud-monitoring systems to keep payment information safe. For developer, V. me has easy integration which just adding simple JavaScript tags and widgets into the app and with a few minor configurations, the app will be ready to accept payments. <sup>[18]</sup>

The growth of digital wallets today isn't where they need to be to define them with the digital wallet definition we have used. Digital wallets currently only include the mobile banking aspect of the definition. Since there are no applications currently available that allows you to show a valid form of identification. The growth of digital wallets today needs to start including the non-transaction parts of a digital wallet. Along with identification, the digital wallet applications need to include other parts of the wallet like retail rewards cards. Once everything that needs to be included in a digital wallet has been included there needs to be some kind of incentive to transition people into using this application. For

sustainable growth they need to create a large target market so that more retail business start to taking the transactions from these applications. Currently the growth of digital wallets today is not where it needs to be for these applications to become successful.

## Approach/Design

### *Focuses*

Ease of use, in terms of this paper, refers to the level of convenience that a user experiences with digital wallet applications. This aspect is being examined by way of survey, interview, observation and literature research. The interactions between a digital wallet application and all its types of users should be studied to determine why these applications are not more successful than they currently are. After applications have been studied in this way, the application developers can determine what changes can be made to digital wallet applications to further their progression in society and make them more widely used.

Security is the degree of protection against danger, damage, loss, and crime. This aspect is being examined by survey, literature research, and current status of smartphone security. Through the different research methods it is important to investigate the current security issues of digital wallet since security is the most important aspect when users use digital wallet. Without security the advantages digital wallet will become useless. However, along with a solid security solution companies will be able to enhance the convenient features of digital wallet.

Fraud is wrongful or criminal deception intended to result in financial or personal gain. Currently, digital wallet allows users to make payments. It already contains partial personal information and it will also contain user identification in the future. Gathering sources from the survey, interview, and researches, we can examine how are we dealing with the fraud cases and what can be done. If security breaches, fraud will happen with the information on the smartphone.

Cost, in terms of the paper, refers to the amount of money that someone (be that a customer, retailer, or just a regular person) pays to use the application that allows mobile payments. This aspect is being examined by survey, research, and comparing pricing. The survey should be looked at to see whether people would be willing to pay extra to use these applications as an alternative to cash and credit cards. The prices should be examined for different applications and compared to the popularity to see whether there is a correlation. Also, the applications should be studied to see how much it cost to run each application. Once all of these are studied it can be decided why these are not more popular and if there is a way to make them more affordable to people and more popular. We chose cost to focus on because cost is a very important aspect when discussing making payments. The success of the application has a lot of dependence on the cost of using the application. When we decided to focus on cost we chose to focus on the different types of costs that go into funding this application. We decided to focus on the cost of the application, a monthly charge, and a fee to make transactions. These costs were the most prevalent in all of the existing applications.

### *Focus Problems*

The population that is not using a digital wallet application has identified concerns with each aspect of this research (ease of use, security, & cost). The most commonly acknowledged ease of use

issues point to apprehension to use digital wallet applications because it is simply not more beneficial to use than a typical wallet. This apprehension is what brought about the thesis of this paper: *can the digital wallet replace the traditional wallet that we know today?* One matter that prevents the expansion of digital wallet application use is that the option to pay in this format (by smart phone) is not widely accepted at businesses. Many businesses are adopting the necessary technologies to accept mobile payments, but because these technologies are not as prevalent as they should be, users of digital wallet applications can not solely rely on their smart phone to make payments and must also carry their traditional wallet. If the purpose of a digital wallet application is to allow users to leave home without their traditional wallet, digital wallet applications cannot be considered a success until users can entrust that they can take care of any monetary transactions by only using their smart phone. If digital wallets are not succeeding by this definition, then digital wallets are subjectively not easier than a traditional wallet. With that statement remaining true, users do not necessarily care to learn that digital wallet transactions take a fraction of the time than that of an average analog monetary transaction. Another convenience matter to address is related to identification. After money and credit cards, identification is the next most common item found in a traditional wallet; yet, there is currently not a digital wallet application on the market that contains features that provide a valid form of identification. An additional problem with today's digital wallet applications is the ability to store specific types of credit cards, affinity cards, etc. Google Wallet, for example, currently only stores credit card information for Citi Bank MasterCard. It is obvious that eventually, all credit card types will need to be supported. Issues of these sorts limit the missions of many of the digital wallet applications: for users to leave home without their traditional wallet.

Digital wallet also faces the security issues. It specifically needs data protection, user authentication, and data breach contingency planning. According to the research paper, "Trends in users' security perceptions regarding mobile phone usage"<sup>[17]</sup> more than half of participants who participated in the research were not using any kind of anti-virus software with their phones. Furthermore, about 30-45 percent of participants did not have screen-saver passcode and were lending their phone to other people. From the research it is noticeable that people are just not aware or ignorant of the security properties of their phone. If digital wallet is not secured people will have to suffer from external frauds. While it may come as no surprise that a substantial proportion of the adult population is affected by fraud, or that fraud is more common than many crimes reported in the National Crime Victimization Survey. Fraud claims many victims. More than half the respondents (58 percent) reported having experienced victimization or an attempted victimization thus far in their life. In the article "Emerging privacy and security concerns for digital wallet deployment",<sup>[5]</sup> one in four Americans in a recent survey were concerned about digital wallets' current security level. As the world is becoming digitalized in general there are growth of threats of viruses through e-mail and networks. Digital wallets cannot be excluded from the threats since the system is also dependent on the network, and the personal data stored in the network is at the risk of being stolen and abused.

One example of online user information type is e-mail. All the electronic services are connected to user's e-mail now days. Users get confirmation mail from the company as for verification. The e-mail might contain the entire user's personal information containing shipping address, phone number, and even social security number. Thus, thefts might easily hack into user's e-mail account and steal user's information.

Another threat is through installation of malicious software. Once malicious software is installed in the phone through spam mails or websites, it could easily steal user's information. Recently, article was

posted about cracking the Google wallet. According to the article “Cracking open your (Google) Wallet”,<sup>[3]</sup> the cracker application can access and display the PIN number in four seconds. Once the PIN is revealed the hacker or attacker has full access to the credit card information and is able to make purchases. Even though it is more convenient to use digital wallet for transactions, it costs more and user’s personal information are threatened. Without security reinforced, digital wallet phones will become enchanting target for hackers.

Even though digital wallet has various advantages, it increases the cost since it does not allow direct transactions. For instance, when the consumer uses the Square digital wallet, he needs to pay around 3 percent fee per transaction. It actually increases the cost of doing business since the fee given to the digital wallet corporation is far more than charged by bank cards. As merchants pay higher amount of fee, it leads to the profit loss. Thus, merchants need to make up those losses by increasing the cost of products.

The biggest problem of this aspect of the mobile banking application is that it is really not possible to run these applications without charging an extra fee. That problem creates the bigger problem that most people have a problem with paying an extra fee when purchasing something. Most people have claimed that they would not use mobile payment applications if they were making a purchase and rather use a form of payment that does not involve paying an extra fee.

The hardware pricing for these mobile applications are non-existent for most current mobile banking applications. Square uses an external hardware for its application to work. For the digital wallet applications we have defined there will be no need for any external hardware. The only hardware that would be needed to use the digital wallet applications would be the purchase of a smartphone.

From all the research we have done on the mobile applications, almost all of the applications either in the Apple App Store or the Android Market were free to download. Since there is no cost of downloading the applications there has to be a cost of using the application elsewhere. The problem that might arise when it comes to the application or software price would be that once digital wallet applications allow other features, for instance presenting a valid form of identification. Once other features are included into the digital wallet applications there might be some additional costs when downloading the applications. This brings up additional concerns when it comes to the digital wallet application because when most people are deciding whether to use this digital application, they will most likely choose the path that has the least costs.

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## Methods

### *Survey*

We constructed and distributed a survey in order to collect information in relation to our topic. The goal of many of the survey questions was to get answers to questions that our team had posed as a result of research. We distributed our survey using academic and social media online resources.

Our survey-takers mostly consist of college students due to the mediums that we chose to distribute our survey through. We accepted this bias in users because more of this age group is likely to own and use a smart phone.

The survey had 19 questions, in multiple choice and scale question (rank from one to five) formats. We received 58 responses.

### *Literature Research*

Many news articles surrounding the topic of digital wallet applications cover the latest breaking issues in regard to these applications. These articles were used to identify problems with our chosen research areas: ease of use, cost and security. Blogs are a great way to simulate an interview with a user. Due to the lack of digital wallet application users available for interview in the local area, this provides feedback on a more detailed level from a first person account.

### *Observation*

It is impossible to understand discussion around something if you have not seen it function in real time. Many more insights were able to be made from primary and secondary research after witnessing how this technology works and interacts with merchants, bank accounts, etc. Due to the limited availability of local merchants employing digital wallet technology, for some of the examples we studied we could only make insights based upon reading about functionality. These were not as easy to study as the applications we were able to witness in real time.

## Experiments & Research

### *Ease of Use*

The end goal of the ease of use experiments and research are to discover whether or not if all of the issues previously mentioned with digital wallets were alleviated (i.e. technology not widely used, not all credit card types accepted, does not provide valid identification), would digital wallets experience the growth in usage they need in order to finally leave traditional wallets at home?

An appropriate way to examine this would be to examine an alternate mobile application that aims to replace a tangible object. A great example for study would be the technology surrounding smart phone camera development and how it has affected the use of traditional cameras. Today, up to 8 megapixel cameras are available on smart phones, and most come standard with a flash. CNBC claims that the “point and shoot” camera is becoming extinct. A point and shoot camera refers to a digital camera that has automatic settings, including automatic focus, and does not allow for the use of interchangeable lenses. A point and shoot differs from the alternative digital camera industry standard: the digital single-lens reflex camera, or DSLR. A DSLR camera can contain automatic settings like point and shoot cameras, but are mostly used for their manual options that allow for more adjustments in focus, shutter speed, and many other features. The reason point and shoot cameras are in danger are because the people that commonly use point and shoot cameras today are merely interested in capturing memories, not learning technical photography. Those interested in the latter are more likely to use DSLR cameras, the features of which are not yet entirely available for smart phones. Not only are people neglecting their

digital point and shoot cameras due to the availability of quality cameras on smart phones, but smart phones are making camera tools available to those that did not previously own a digital camera. As of July 2011, 44.3% of people had completely replaced their camera needs with their smart phone. CNBC reports that the number one type of device used to upload pictures to Flickr, a popular photo-sharing web service, is the iPhone 4.<sup>[12]</sup>

In the survey that we distributed, several of the questions were aimed at being particularly helpful in gaining insights about ease of use for digital wallet applications. This was done by asking simple questions with a limited number of answers to be able to analyze the given data better. Some conclusions we were trying to get were that people lose their phone less than their wallet, and that people are actually interested in using digital wallet smart phone applications.

When doing literature research to cover ease of use, we were specifically looking for two types of articles or journals. The first type of article we were searching for were articles that evaluate the development of digital wallet applications (how widely available they are, what features they contain, etc.). The second type of written work we searched for were first person accounts of people who have actually used digital wallet applications and their evaluation. As previously mentioned, we searched for blogs containing these first person accounts, because they can be used to simulate an interview experience.

### *Cost*

The associated costs that go along with using a digital wallet application are the cost from the software, the hardware, and the transaction costs. The software costs are the costs that come from downloading the actual application from either the Apple App Store, or the Android Market. This cost is currently non-existent in digital wallet applications because most only allow transaction and have a subsequent cost. We predict that once these mobile banking applications have more features than just processing transactions they will have a cost of downloading the application. The cost from the hardware comes really only from the purchase of the software, unless there is some other hardware required to use these applications. There is not currently hardware for these applications other than the card swipe hardware for Square.

The questions that are associated with cost are, would you be willing to pay a 2-3% increased product price when using a mobile payment application? and what factors concern you most about using a digital wallet application? These questions showed that most people would not be willing to pay an increased price when using a mobile payment application and that people are most concerned with security and not the cost of these digital wallet applications. This shows that when it comes strictly to cost, people are against spending more money, but when it comes to the overall application people are more concerned with the security of their own information. The producers of these applications need to take that into mind when developing their future software to make their applications safer and appealing to the consumer.

### *Security & Fraud*

To secure the phone and usage of digital wallets physically securing phone with passcode or some kind of verification is important. However, usage of anti-virus software is important to get protection against root exploits and spyware. Currently, there is a lot of anti-virus software out in the



market. Some of them include, BullGuard Mobile, ESET Mobile, Norton Smartphone Security, and Trend Micro Mobile Security. The article “Seven antivirus solutions for Windows Mobile and Symbian”<sup>[9]</sup> states that the current anti-virus software are directed toward Windows Mobile and Symbian device and the newer devices like iPhone, Android, and BlackBerry suffered less from the external viruses. The question is whether all of the phones will be stay firm against viruses in the future. The research paper titled “Surveying users’ practices regarding mobile phones’ security features”<sup>[16]</sup> found out that 91% of 282 participants were not using any kind of anti-virus software. However, with the introduction of digital wallet, the usage of phones will not be the same as the past. As people do not use computers without anti-virus software, usage of anti-virus will have to increase.

From the survey, we found out this interesting fact: 59% of the users answered that they always or sometimes use mobile banking, but did not have passcode lock on their phone. Even though they have lock on their phone, 17% of users let at least one person know their passcode and let other people to use it.

The questions asked in the survey were directed to ask participants about their current security level when using their phone. The questions asked if participants were using any kind of passcode and anti-virus software to secure their phone or if they are keeping their phone physically ‘safe’. Furthermore, some of the questions asked how they will change their habits with the incorporation of digital wallet. The questions asked if they are willing to pay for the anti-virus software or the extra fee caused by security. More than half of participants answered that they will be willing to pay the extra fee. From this result we were trying to understand the current position or importance of security when using digital wallet.

## Evaluations

### *Ease of Use*

By studying the development of smart phone camera technology, we have gathered that for a mobile application to take place of an object it needs to contain at least the basic functions of the object itself. Smart phone cameras started taking the place of point and shoot cameras after they started adding basic functions flash, focus and zoom. For the digital wallet mobile applications to succeed, they need to offer storage for multiple types of credit cards, a valid form of identification and storage for valid customer affinity cards and coupon offers. Due to the barriers digital wallet applications are currently facing, not all of these functions are available. The replacement of traditional wallets will not be possible without this functionality.

We were able to draw several insights out of the results from the survey we conducted related to ease of use. Of the 47 participants in our survey who claimed to “always” carry a wallet, to the question “Would you be interested in using a digital wallet application if it provided a valid form of identification?” 57% responded “yes” and 30% responded “maybe.” With a positive response to this question from 87% of participants, this is glaringly obvious supportive claim to the direction that digital wallet application development needs to go. As previously stated, without including one of the basic features of a traditional wallet, valid identification, and digital wallet applications cannot truly meet their missions of replacing the traditional wallet we know today. Of the 22 participants that have reportedly “never” use their phone for mobile banking, nearly half of them responded that they had lost their wallet 1 to 3 times. This is fairly large market that might not be aware of mobile banking features that are currently available, and could possibly lower their risk of theft by trying out digital wallet applications.

Actually, 56% say their biggest struggle with their traditional wallet is losing it, and 21% say their biggest struggle with their traditional wallets is theft. This large amount of our demographic could really benefit from secure digital wallet applications, because it means one less thing to keep track of.

Paul Korzeniowski's article "Mobile Banking's Mixed Message" provides an incredible summation of the digital wallet application industry today. Many of the things Korzeniowski discusses have already been mentioned in this paper (digital wallet applications are not widely used; many vary in functionality, etc.). A particularly interesting insight provided was that eighteen of the nation's top twenty banks are currently allowing users to somehow manage finances with their mobile phone. This number will boost development, because the competition for the best mobile banking and digital wallet application is rising.<sup>[10]</sup>

A blog entry published by Katherine Boehret titled, "Google Mobile App Aims to Turn Phones into Wallets" provides a first person account of how an individual uses Google's digital wallet smart phone application, the Google Wallet. In order to use the Google Wallet, Boehret used the Spring Nexus S 4G on the Android network in combination with her CitiBank MasterCard. While she points out the barriers that we have discussed already in this paper, she claims that using the Google Wallet is "delightfully easy to use." Aside from the discussed issues in her blog, as well as this paper, the Google Wallet can be expected to do well in the future.<sup>[6]</sup>

### *Cost*

The survey showed that people are against paying extra to make their purchases. 72% of people said that they would not be willing to pay a 2-3% increased purchase price when making a transaction. They also showed that cost is not the most important issue when it comes to these applications. Most people said that the security of their information is the most important thing to them in regards to these applications. Since they said that cost isn't the most important there are more pressing issues that the manufacturers of these applications should address before the cost. When it comes to strictly cost of these applications they should look to incentives for these people to use their digital wallet application. The main idea is that people would like to save the most amount of money possible in every aspect of their lives. This means that in every aspect of their mobile wallet application, they need to provide a reason for people to use the software on their phone over their actual wallets.

When reading about the mobile payment applications we learned that these applications are much more popular in the Asian pacific than anywhere else in the world.<sup>[20]</sup> They have shown that these applications need to become more popular and safer before they become the standard for all purchases worldwide. The security issue is the biggest problem when it comes to these applications. Currently a majority of the applications are SMS-based and are used by sending a message over a wireless phone network. The more extensive applications have encountered issues of security and hardware interoperability.<sup>[20]</sup> This is especially frustrating because the use of digital wallet requires the use of a more extensive mobile application. If these applications cannot become secure then they will ultimately fail. The current system for SMS messaging these transactions is functional, but ultimately falls short of the digital wallet definition.

## *Security & Fraud*

According to the survey result, we were able to reach some of insights related to security aspects of digital wallet. The current security level of participants who participated in the survey was very vulnerable to outside attacks. Out of 59 participants 68 percent said that they were not using any kind of anti-virus on their phone. Furthermore, 61 percent of the participants were not even using any kind of passcodes to secure their phone at the very least. However, ironically enough participants major concern when using digital wallet was security. 67 percent of participants answered that security will be the major concern when using digital wallet in the future. Even though people are not concerned really bother about current security standards, it was evident people will be sensitive about security when replacing their physical wallet to a digital wallet.

The literature research related to security surprisingly showed similar results to the survey results. People had doubts about how secure digital wallet will turn out to be in the future, but are not currently putting any effort to secure their phone. In order to successfully characterize the benefits of digital wallet people will need to exert oneself and get into a habit of securing their phone beforehand.

I found interesting literature research related to fraud that France cut card fraud by more than 80% by using PCI compliant EMV Chip technology and PIN number; which is digital wallet applications, instead of mag-stripe and signature at the point-of-sale. [19] There aren't many reports about digital wallet fraud cases. Just like before credit card become popular, digital wallet will become traditional wallet. User's habit is important to prevent from the fraud.

## Future Work & Conclusion

Digital wallet will revolutionize how people spend their money in the future. People will experience much more simple financial transactions through their smart phones. Dr. Muhammed Khan, professor and program coordinator of wireless telecommunications at Humber said the consumers or users will be able to have a list of payment options on their smart phones. He further stated that technology is currently in use in countries like Canada and company such as PayPal is testing the system. According to the article, "Digital wallet seeks to revolutionize currency, spending", PayPal has been developing the digital wallet concept for ten years. PayPal looks to connect and make money transferable beyond smart phones. The development of digital wallet will change consumers' lifestyle. <sup>[4]</sup>

The obvious answer here is that digital wallet applications need to expand to the point where there are no barriers preventing users from the ability to use a digital wallet application. This means that all credit cards need to be accepted for use in applications, and the technology needs to be widely available in businesses. Valid forms of identification need to be made available within applications and any other item that a user would keep in a wallet should also be available (customer affinity cards, coupons, etc.). It is inevitable that all types of credit cards will be available for use through digital wallet applications, so development should shift focus to the issue of valid identification. This may require some work with establishments and the government, due to the restrictions that go along with identification.

Security will be the main concern for the users when using digital wallet service. Therefore, the providers who are providing the service needs pay special care in protecting user's information from frauds and identity thefts. One way of protecting users' information could be through strong encryption of the data. If all of user's information is encrypted as a passcode, it will be harder for outsiders to steal the

information. Furthermore, the digital wallet system has to accompany anti-virus software to prevent any malicious software that could permeate into the device. If the device is able to filter the viruses in the first place, it will be less likely to get hacked.

Cost needs to be handled from here on out as a somewhat of a fear to the consumer. Since most people are trying to save the most money they can when making a purchase or processing a transaction they need to have some incentive to use the digital wallet application. Our suggestion would be some kind of rewards program that would allow people to use the application while not spending the extra money that would turn people away. This way these applications can become more popular and the standard when it comes to making purchases. That is the way that these applications would become more popular and used by more consumers. If these applications can make this turn toward making them the standard in making transactions they will be able to sustain growth.

The question that this paper aimed to answer was “Can the digital wallet replace the traditional wallet that we know today?” Currently there are many barriers standing in the way of this becoming a reality. The digital wallet applications that are available today are restricted by the types of bank accounts they are compatible with and the lack of the necessary technology to accept payments available in stores. Some other restrictions include the lack of a valid form of identification, the need (and lack of use of) antivirus software and the associated costs for hardware, software and transactions. Until these matters are addressed, it is impossible to expect that the replacement of traditional wallets can become reality. Developers of smart phone digital wallet applications are addressing these matters now, but these things take time. After all of barriers causing the popularity of digital wallet applications to remain low have been attended to, it is our belief that digital wallet use will grow exponentially. While they may not make the traditional wallet obsolete, they should allow for the willing users to leave their traditional wallet at home.

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